TRANSCRIPTION

TRANSCRIPTION UNIT

MECHANISM OF TRANSCRIPTION

INITIATION

PROKARYOTES
(takes place in cytoplasm)

- SIGMA (σ)
- RNA POLYMERASE HOLOENZYME
- STRUCTURAL GENES are POLYCISTRONIC
- PROMOTERS; TATAAT; "-10 sequence"; PRIBNOW BOX
- "*RECOGNITION SEQUENCE*"; "-35 sequence"; TTGACA
- (2αββ'ωσ)

EUKARYOTES
(takes place in nucleus)

- includes TATA box and CAAT box
- several transcription factors must bind to the DNA before RNA Polymerase binds
- additional transcription factors bind to the DNA along with RNA Polymerase II, forming the Transcription Initiation Complex
- Sigma factor is absent and primer is not required but it requires ENHANCERS
- STRUCTURAL GENES are monocistronic
- PROMOTERS
  - "-25 sequence"; TATA BOX
  - "-75 sequence"; GGCCAATCT; CAAT BOX
- 3 types RNA POLYMERASES involved
  - *RNA Pol I*; transcribes *rRNAs*
  - *RNA Pol II*; transcribes *mRNA, hnRNA*
  - *RNA Pol III*; transcribes *tRNA, 5SrRNA, etc.*

ELONGATION

TERMINATION

- triggered when RNA Polymerase encounters a particular DNA sequence causing polymerase to lose affinity for DNA template
- RNA Polymerase disengages from DNA and RNA molecule is released for *TRANSLATION* or *POST TRANSCRIPTION PROCESSING*
- may or may not require rho (σ) factor
- mRNA do not undergo any processing; may undergo TRANSLATION before completion of transcription; coupled; processes takes place in cytosol and in 5'-3' direction
- *Prokaryotic mRNAs terminate with the sequence 5'-UUUUUUUA-3', which allows nascent transcript to form hair loop that disrupts RNA-DNA hybrid as well as the interaction between DNA and polymerase resulting in disassociation and termination of transcription of RNA molecule.*
- Termination-Coupled transcription translation is not possible in eukaryotes, as transcription products i.e., RNA pass from nucleus to cytoplasm for translation. The nascent RNA i.e., hnRNA or primary transcript undergoes modifications to form functional mRNA.

POST TRANSCRIPTIONAL MODIFICATION OF hnRNA

- **CAPPING**
  addition of methy guanosine triphosphate (mGPPP) that protects mRNA from nucleases and provides ribosome binding site
- **TAILING**
  addition of 200-300 polyadenylate residues with the help of poly A polymerase and it protects 3' end from degradation by exonucleases.
- **mRNA SPLICING**
  removal of introns through cutting by snRNPs and joining by ligase of exons in defined order.